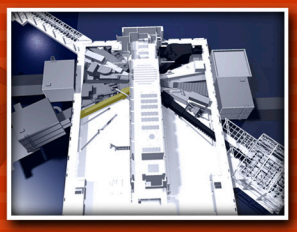
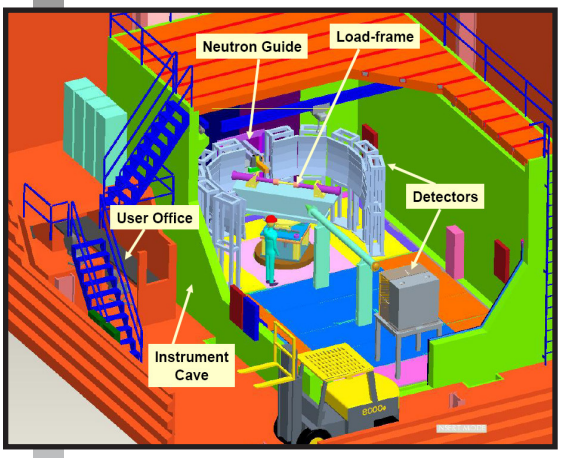
INSTRUMENT Fact Sheet

BEAM LINE 7



ENGINEERING MATERIALS DIFFRACTOMETER

The Engineering Materials Diffractometer, VULCAN, on beam line 7 will help users understand a broad range of engineering and material science problems. Characteristics of the instrument include stress mapping of engineering components with a 1 mm^3 sampling volume, in-situ loading with 10-20 reflections, and real-time studies of the kinetics of materials in sub-second time-scales. The basic design allows users to determine stress distribution in engineering components and to understand more about the deformation of materials under multi-axial loading. VULCAN will help scientists and engineers test the reliability of structural components and better understand how materials deform. The flux on sample will reach $1x10^8$ neutrons/cm^2/sec, providing a high intensity for fast kinetic studies. The instrument team plans to have a small angle detector to allow users to conduct simultaneous measurements of small angle scattering, thereby enabling studies of the evolution of material structures at multiple length scales. Major funding for the construction of VULCAN is provided by the Canada Foundation for Innovation (CFI). In addition, through the University of Tennessee (UT), the U.S. National Science Foundation Major Research Instrumentation Program funded the sample environment suite for VULCAN. The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, provides further funding for completing the instrument.



RECENT SIGNIFICANT EVENTS:

- The contract for the external building has been awarded, and ground breaking is scheduled for mid-June, 2006.
- The instrument is scheduled to be commissioned in 2008.
- Major components for the instrument are being ordered, such as the neutron guides, double-disc chopper, sample positioner system, and detector.
- Studies of transient behaviors during welding have already been demonstrated; i.e. the in-situ study of friction and stir welding by Dr. Z. Feng, et al., ORNL.
- Working closely with UT on their NSF International Materials Institutes Program for "Advanced Neutron Scattering Network for Education and Research" (ANSWER) for community outreach
- Shutter and inserts have been installed
- Poured-in-place shielding has begun

SPECIFICATIONS

Beam line	7
Moderator	Decoupled poisoned water
Source-sample distance	43.5 m
Sample-detector distance	1.5 – 2 m
Detector angular coverage	$60^o < 2\theta < 150^o$
Wavelength bandwidth	~1.3 Å
Resolution	0.2% in high-resolution mode
Flux on sample (n/s/cm^2/Å)	$3x10^7$ in high-resolution mode $1.2x10^8$ in high-intensity mode
Gauge volume	3D strain mapping: 1 mm^3 1D strain mapping: 0.1 mm
SANS Q range ($Å^{-1}$)	0.01 – 0.2

CITATIONS:

X.-L. Wang, T.M. Holden, G.Q. Rennich, A.D. Soica, P.K. Liaw, H.Choo, and C.R. Hubbard. "VULCAN – The Engineering Diffractometer at the SNS," to appear in Physica B

X-L. Wang, "Applications of neutron diffraction to engineering problems," overview article in JOM, March, 53-58, 2006.

FOR MORE INFORMATION, CONTACT VULCAN STAFF:

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SNS

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